

## **Lake Restoration Report and Plan 2006**

### **Iowa Department of Natural Resources**

As the result of increased interest in lake restoration by the Legislature and the Governor, the Department of Natural Resources is reporting on lake restoration results and plans.

Consensus recommendations from the Governor's Iowa Water Summit, 2003, included (1) comprehensive, locally-led watershed planning-action approach to water quality improvement; (2) target scant available resources for results; and (3) demonstrate success. The Governor, in his priorities, focused attention upon water quality improvement using an indicator of the reduction of impaired waters. Such factors make lakes, and their associated watersheds, as prime locations to focus attention and demonstrate success. In addition, lakes are very popular with Iowans: 60% of Iowans use our lakes each year and they visit them an average of eight times per year. Since 2000, 131 lakes have been monitored each year giving us an invaluable basis for understanding and targeting lakes. Computer modeling of watershed landscapes has improved, enabling us to identify locations most responsible for problems, and model potential corrective actions to estimate results. Recent research has identified the importance of recreation for economic growth, especially water-based recreation.

The Department of Natural Resources is focusing on restoring impaired lakes to improve the healthy quality of life for Iowans and demonstrate water quality improvement. Communities are rallying around their water resources as they seek population growth and economic success. The Iowa Great Lakes, Storm Lake, Crystal Lake, Creston and Clear Lake are obvious examples, but other communities including Osceola, Marshalltown, Newton, and Brighton are identifying the importance of lakes for their futures, as well. The distribution and nature of Vision Iowa grants, Community Attraction and Tourism grants, and now, Great Places, all further emphasize the importance of water to community quality of life and economic growth.

The DNR has conducted several very successful lake restoration efforts, and is currently engaged in several more. Through those restorations, we have learned that the lake, and the watershed that restores that lake, must both be involved with the process. Watershed nutrient and sediment source reduction, aquatic corridor habitat protection, and in-lake management must all be implemented to restore our lakes and demonstrate success. Water quality begins with the watershed. All sources of sediment, chemical and nutrient contamination must be evaluated, and the most important sources need to be targeted and reduced. This includes gully and streambank erosion. Water treatment techniques, especially wetlands and habitat improvements including buffers require evaluation and implementation to further reduce pollutants in our lakes. Finally, in-lake improvements, including control of nuisance fish species, lake deepening, and shoreline protections must be done. Restoration at Lake Ahquabi and Swan Lake demonstrate the potential for improvement as well as how rapidly improvements can be noticeable. They are also examples that reveal the benefits to the public and the community through increased visitation rates, improved fishing, boating and swimming opportunities.

The Department has set five goals for consideration of lake restoration projects.

- (1) Ensure a cost effective, positive return on investment for the citizens of Iowa.
- (2) Ensure local community commitment to lake and watershed protection.
- (3) Ensure significant improvement in water clarity, safety, and quality.
- (4) Provide for a sustainable, healthy, functioning lake system.
- (5) Result in the removal of the lake from the impaired waters list.

The Department recognizes that appropriate planning is the keystone to a successful restoration project. Feasibility studies of the lake and watershed must be conducted to develop a cost effective restoration project. These must consider the causes, target the sources and magnitude of lake impairment, evaluate the feasibility of various lake and watershed options to restore water quality, establish water quality goals, and develop a timetable for implementing the project and achieving the water quality results. In addition, this must be done in the context of promoting recreation and the quality of life in nearby communities, while stimulating economic opportunities. The local community must be an integral part of the process with significant local leadership in planning and implementation, and appropriate community resources invested in the project.

The department recognizes a few principles that will guide planning.

1. Rough fish (especially carp and buffalo) will be controlled as a primary option wherever they are a significant source of water quality degradation. Control of rough fish can have significant impacts on water quality.
2. If proposed, dredging of the lake will be conducted to a mean depth of at least ten feet to gain significant water quality benefits. Lake deepening to shallower depths is acceptable if a combination of biological and other physical alternatives are sufficient to assure water quality targets or if special conditions exist in the lake or adjacent to the lake that require special protection.
3. Watershed protection for the delivery of phosphorus, sediment, and bacteria must be controlled or plans in place to protect the lake from these pollutants. This goes beyond the standard soil erosion goal of 'T' which only relates to soil erosion. Water quality protection may require much better soil erosion control than T, and also requires reduced soluble P delivery and delivery of P from gully and streambank erosion. Similarly, bacterial loads must be minimized to protect people from waterborne pathogens. Loads of phosphorus, sediment and bacteria, in conjunction with in-lake management, will meet or exceed the following water quality targets.
  - a. Clarity: A 4.5 feet secchi depth will be achieved fifty percent of the time from April 1 through September 30.
  - b. Safety: Beaches will meet water quality standards for recreational use.
  - c. Biota: A diverse, balanced, and sustainable aquatic community will be maintained.
  - d. Sustainability: The water quality benefits of the restoration efforts will be sustained for at least 50 years.

The department is developing a priority lakes and watersheds protection and restoration protocol for Iowa's significant, public lakes. In this screening process, the department is developing preliminary costs for lake and watershed restorations, exploring methods to estimate benefits from lake and watershed restoration, and assessing priorities based on current use and potential use for our lakes. Priority lakes can then be utilized to begin a dialogue with communities adjacent to priority lakes and to begin a cooperative process of lake and watershed assessment, restoration feasibility, and, ultimately, cooperative lake restoration action plans. Results of this process will be presented in future reports.

### **DNR Proposed Lake Restoration Plan**

Three Iowa lakes have met all initial requirements for moving forward with lake restoration. The three lakes are Clear Lake (Cerro Gordo County), Crystal Lake (Hancock County), and Storm Lake (Buena Vista County). In addition, restoration work is being finished on Lake of Three Fires (Taylor County), Five Island Lake (Palo Alto County), and Viking Lake (Montgomery County). Feasibility studies and or watershed improvements prior to lake restoration are or will be underway at Lake Darling (Washington County), Prairie Rose Lake (Shelby County), Lake Manawa (Pottawattamie County), Carter Lake (Pottawattamie County), Lizard Lake (Pocahontas County), Union Grove Lake (Tama County), Rock Creek Lake (Jasper County), Lower Gar Lake (Dickinson County), Easter Lake (Polk County), Silver Lake (Delaware County), Green Valley Lake (Union County), and a few other undetermined lakes in NW Iowa for which shallow lake management strategies will be attempted.

The Department of Natural Resources contracted with Iowa State University in 1980 and updated the information in 1991 to develop "A Classification of Iowa's Lakes for Restoration". This study was required by the United States Environmental Protection Agency (EPA) through Section 314 of the Clean Water Act to be eligible for federal lake restoration funding. The specific objectives of the study were:

- 1) To provide an evaluation of current conditions in significant publicly owned lakes in Iowa.
- 2) To develop a ranking of lakes in need of management and restorative measures based on existing water quality, pollution potential, and public benefits.

A group of 115 publicly owned lakes were evaluated using criteria that considered watershed soil conservation practices, water quality information, public benefits, and restoration effectiveness. Once this basic information was obtained, public meetings were held in communities near these lakes to solicit public opinion and support for moving forward with diagnostic/feasibility studies to evaluate lake restoration, options, costs and achievable results.

In 2005, a draft report on 127 lakes attempted to continue the classification process for lake restoration that began in 1980. This latest effort has the benefit of the lake monitoring data which has been collected annually since 2000. Downing, et al, (March, 2005) presented the results of this work, and it is now being revised. However Downing's work is the scientific basis for the Department's screening of lakes for

restoration and prioritization. It is also the basis for preliminary cost estimates both for lake and watershed restoration.

### Clear Lake

Clear Lake is a 3,625 acre natural lake in Cerro Gordo County with a watershed to lake area ratio of 2.3 to 1. It is Iowa's third largest natural lake with a watershed area of 8,454 acres consisting of 59% cropland, 10% urban areas, 9% wetlands, 8% grasslands, 5% forest, 5% roadways, 2% farmsteads, 1% pasture, and 1% state parks.

### Feasibility Planning

1980, 1991 and 2005 lake classification reports each identified Clear Lake as a high priority candidate for lake restoration. In 1998, DNR contracted with Iowa State University to conduct a Diagnostic/Feasibility Study of Clear Lake and its watershed. Also in 1999 Cerro Gordo County contracted for a Storm Water Management Plan and in 1995 the Clear Lake Enhancement and Restoration (CLEAR) group, the Natural Resources and Conservation Service, Cerro Gordo and Hancock County Soil and Water Conservation Districts, Iowa Department of Agriculture and Land Stewardship (IDALS) and the Iowa Department of Natural Resources developed a watershed protection plan. In February, 2005, the Department completed the TMDL for Clear Lake.

### Local Support and Commitment

Local support and commitment for the restoration of Clear Lake is outstanding.

Public meetings conducted by the DNR and CLEAR group with Clear Lake communities determined a strong local interest to develop lake restoration options. Clear Lake has a long and interesting history as a focal point for recreation in Iowa. The organization known as "The Association for the Preservation of Clear Lake" was formed in the 1930's. This group was instrumental in assisting with the acquisition by the state of both Ventura Marsh and McIntosh Woods State Park. Several significant environmental problems (1979 major winter fish kill and the 1998 summer bacteria problems) resulted in a local outcry for lake restoration. Beginning in 1998 the City of Clear Lake, the Association for the Preservation of Clear Lake and the CLEAR groups provided funding for bacteria, nutrient and water monitoring initiatives. Cerro Gordo County completed a storm water management plan in 2000, followed by continuing storm water improvements funded by the city of Clear Lake, Cerro Gordo County, the DNR, the Hanson Foundation and State of Iowa. Other water quality projects and acquisitions of critical land components have also taken place. Additional work has also taken place in the watershed utilizing federal wetland programs. Currently, DNR is attempting to trace the origin of bacteria in the lake, especially as they impact public beaches. As of December, 2005 funding for work at Clear Lake has totaled \$7,407,470 (51% Federal – 49% non-Federal).

### Water Quality Goals

Clear Lake was originally placed on the impaired waters list in 1998 for nutrients and algae. Restoration of Ventura Marsh, the main watershed entry point to Clear Lake is also critical to this projects success. The DNR has entered into a joint agreement with the

Corps of Engineers utilizing the 206 Aquatic Ecosystem Restoration Program to restore the marsh to its original function as a nutrient sink. As such the marsh will filter water as it enters Clear Lake. The value of the DNR's property will serve as the state match for this federal project. This work will also be combined with an intensive common carp removal program that will utilize harvest by commercial fishermen.

A plan has been developed and endorsed by the DNR and the local community to dredge a portion of Clear Lake to improve water quality. This was the preferred dredging option that was presented in the diagnostic/feasibility study. This project will require acquisition of a dredge containment site, construction of the site and dredging 2.3 million cubic yards of sediment. Total project cost is estimated at \$13,000,000.

Past, current and future watershed, wetland, urban, and lake restoration, together with carp removal projects will ultimately result in the removal of Clear Lake from the Impaired Waters List.

### Benefits

Restoration efforts and improvements in water quality has the potential to more than double the annual economic return (currently estimated at \$30, million) that Clear Lake generates to the local economy. In a separate and very different analysis, preliminary analysis by the Center for Agriculture and Rural Development at ISU has projected a 12:1 benefit to cost ratio (or more) for lake and watershed restoration efforts that would result in good water quality at Clear Lake. Both estimates are very positive.

### Recommended Budget and Work Plan for Clear Lake

FY07: \$4,000,000; containment site acquisition and construction; dredging

FY08: \$2,500,000; dredging

FY09: \$2,500,000; dredging

Current Budget for FY06: \$110,000

### Crystal Lake

Crystal Lake is a 269 acre natural lake in Hancock County with a watershed to lake area ratio of 8.8 to 1. The lake has a watershed of 2,357 acres consisting of 62% row crop, 19% grassland, pasture and wetlands, 16% residential and roads, and 3% forest.

### Feasibility Planning

Both 1980 and 1991 lake classification reports identified Crystal Lake as a high priority candidate for lake restoration. In the 2005 draft report, it was identified as having moderate priority for restoration. In 2001, an Iowa State University diagnostic/feasibility study was completed for Crystal Lake. In August, 2002, the Department completed the TMDL for Crystal Lake.

### Local Support and Commitment

Local support and commitment for the restoration of Crystal Lake is truly outstanding. The communities' identity is clearly associated with the lake.

Public meetings conducted by the DNR at Crystal Lake in 1996 determined strong local interest to develop a strategy for lake restoration. A local 'Save the Lake Committee' was formed and raised 25% of the funds necessary for the diagnostic/feasibility study. When the study was presented in 2002 at a public meeting, more than 300 local residents were in attendance to review the studies' recommendations.

### Water Quality Goals

Crystal Lake was originally placed on the impaired waters list in 1998 for organic enrichment following a sequence of events. In 1986, the fish population of Crystal Lake was renovated to produce a more consistent high quality sport fishery with clear water. A byproduct of this renovation was excessive aquatic plant cover across most of the lake. Common carp again reentered the lake during the high water levels of 1993, and the explosion of carp rapidly deteriorated the water quality to the impaired state.

Watershed analysis by the NRCS and DNR also identified areas that were adversely impacting water quality. Sediment and phosphorus delivery to the lake was significantly reduced. A large sediment/nutrient pond was constructed that will reduce nutrient delivery and sediments to Crystal Lake by 20%. This reduced potential annual sediment delivery to 0.87 tons per acre per year.

Dredging is proposed to remove 1.1 million cubic yards of sediment from Crystal Lake. This should reduce the effects of nutrient enrichment and limit areas of excessive aquatic plant growth. Following dredging activities, the fish population in Crystal Lake will be renovated to remove the common carp population. The small lake outlet structure will also be modified to prevent future introductions of undesirable fish species. The combination of this watershed and lake restoration work will remove Crystal Lake from the Impaired Waters List.

### Benefits

This small community and the surrounding rural area is an excellent example of a locally driven project that will benefit this area. Following restoration, improved fishing opportunities alone could add nearly \$400,000 annually to the local economy, in addition to improving water quality and benefiting other water-based recreation. Crystal Lake should once again be "one of the most beautiful lakes in the state and one which should, in the future, have great value as a place of recreation", as stated in the 1917 State Highway Commission report on Iowa Lakes and Lake Beds.

### Recommended Budget and Work Plan for Crystal Lake

FY07: \$1,400,000; Dredging

FY08: \$250,000; Dredging

FY09: \$0

Current Budget for FY06: \$1,500,000

### Storm Lake

Storm Lake is a 3,147 acre natural lake in Buena Vista County with a watershed to lake area ratio of 4.4 to 1. It is Iowa fourth largest natural lake with a 13,770 acre watershed

consisting of 82% cropland, 13% urban land, 3% roadways, ditches and farmsteads, and 2% wetlands.

### Feasibility Planning

1980, 1991 and 2005 lake classification reports each identified Storm Lake as a high priority candidate for lake restoration. In 1994, DNR contracted with Iowa State University to conduct Diagnostic/Feasibility Study of Storm Lake and its watershed. Also in 1994, the Buena Vista Soil & Water Conservation District, Storm Lake Improvement Commission and the Iowa Lakes RC&D identified watershed needs and together with the Soil Conservation Service produced a watershed protection plan. In March, 2005, the Department completed the TMDL for Storm Lake.

### Local Support and Commitment

Local support and commitment for the restoration of Storm Lake has been historically good and must now be regarded as outstanding.

Public meetings conducted by the DNR with Storm Lake communities determined a strong local interest to explore lake restoration options. Initially, area communities formed the "Lake Preservation Association (LPA) in 1991. Conservation groups formed the Storm Lake Watershed Protection Program to make watershed improvements as outlined by the USDA NRCS recommendations. This initial watershed work began in 1994 and was completed in 2000. In 2004, the Buena Vista Soil & Water Conservation District received a \$463,000 Iowa Water Quality/Watershed Protection Program grants for Best Management Practices such as nutrient management, wetland construction, pasture and livestock management, grass buffer systems and waterways and wellhead protection. In 2005 the District and the City of Storm Lake received \$500,000 to address urban stormwater runoff and agricultural runoff into the lake through the Watershed Improvement Review Board.

Lake dredging and containment site construction activities initially began in 2001 and were completed in 2002 at a total project cost of \$3.275 million. Funding limitations restricted this initial dredging activity to 180 acres of the lake. The Lake Preservation Association expressed a strong interest to continue dredging to achieve better water quality

The LPA locally raised and received federal grants totaling over \$ 1 million to continue dredging at Storm Lake. They purchased a dredge and in an agreement with the DNR each group has provided \$900,000 from 2003 through 2005 to continue dredging operations. To reach project goals will require another 10 years of dredging operation at a projected cost of \$12 million (\$6 million State - \$ 6 million Local).

### Water Quality Goals

Storm Lake was originally placed on the impaired waters list in 1998 for turbidity. The Lake Preservation Association set a goal of dredging an additional 1,500 acres of Storm Lake to an average depth of 13 feet following the guidelines of the diagnostic/feasibility study. The Iowa DNR and local sponsors will also be entering into an agreement with

the United States Army Corps of Engineers to improve the Little Storm Lake and wetland area and restore the wetland's function in improving Storm Lake's water quality. The City is improving stormwater delivered to the lake, and recent improvements to IBP also are improving the storm water delivered to the lake. This aggressive dredging goal, coupled with watershed improvements and restoration of Little Storm Lake and Wetland should make significant improvements in water quality. Past, current and future watershed, wetland and lake restoration projects will ultimately result in the removal of Storm Lake from the Impaired Waters List.

### Benefits

Restoration efforts so far have leveraged a \$35 million economic development Project ALWAYSIS that has the potential to create 690 new jobs and over \$28 million in new spending in Storm Lake and Buena Vista County. With local support, the Iowa DNR is designing a \$ 3 million renovation of the Storm Lake Marina that will improve lake access and compliment the ALWAYSIS project. Preliminary analysis by the Center for Agriculture and Rural Development at ISU has projected a 2:1 benefit to cost ratio (or more) for lake and watershed restoration efforts at Storm Lake that would result in good water quality. .

### Recommended Budget and Work Plan for Storm Lake

FY07: \$500,000; Dredging

FY08: \$500,000; Dredging

FY09: \$1,000,000; Dredge Containment Site Development; Dredging

Current Budget for FY06: \$400,000

### **Other Lake Restoration Projects**

Recommended budget and work plan for:

**Five Island Lake (Palo Alto County):** continue city dredging project

**Viking Lake (Montgomery County):** complete watershed work, shoreline deepening and shoreline protection

**Lake Darling (Washington County):** complete watershed work, conduct diagnostic/feasibility study, acquire dredge containment site, containment site design and construction, dredging

**Lake of Three Fires (Taylor County):** complete wetland above lake that will protect lake and improve water quality

**Prairie Rose Lake (Shelby County):** complete watershed work, conduct diagnostic/feasibility study, containment site acquisition, construction and dredging

**Lake Manawa (Pottawattamie County):** complete water level study and work with DOT on future lake dredging project (DOT funded)

**Carter Lake (Pottawattamie County):** partner in diagnostic/feasibility study

**Lizard Lake (Pocahontas County):** partner in diagnostic/feasibility study

**Union Grove Lake (Tama County):** repair spillway, reconstruct sediment/nutrient dike and dredge lake

**Rock Creek Lake (Jasper County):** continue watershed work and acquire and construct a dredge containment site

**Lower Gar Lake (Dickinson County):** partner in diagnostic/feasibility study, acquire and construct a dredge containment site, dredging

**Green Valley Lake (Union County):** repair spillway, conduct diagnostic/feasibility study, acquire and construct a containment site and dredge

**Easter Lake (Polk County):** partner in diagnostic/feasibility study

**Silver Lake (Delaware County):** repair dam and spillway prior to restoration

**Shallow Lakes Management Initiative:** joint project with Ducks Unlimited, fisheries, wildlife groups to improve water quality, increase quality waterfowl and fishery use in lieu of dredging

**Priority Lakes Watershed Improvements:** partner in watershed work to improve water quality and protect restoration investments

Recommended Budget for Other Lake Restoration Projects

FY07: \$ 2,600,000

FY08: \$ 8,600,000

FY09: \$10,850,000